LOW COST valve amplifier

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WITH the current trend towards complicated transistor Hi-Fi amplifiers and preamplifiers, it is often forgotten that very good quality can be obtained from fairly simple, low cost valve amplifiers. The amplifier described here is a two valve one giving very acceptable quality at a cost of under £6.

The Circuit

The input is fed directly to the tone and volume control stage and although this is a passive network, gives wide control over the tone. The output from this is fed to the first valve, EF86, which is a high gain, low noise type, this acts as a simple voltage amplifier. Negative feedback from the output transformer is fed to the cathode of this stage which makes use of extra gain by improving the overall quality.

The output of the first stage is fed to the triode section of the ECL86 which further amplifies the signal and applies this to the grid of the output section in the same valve which applies the signal to the output transformer in the anode circuit.

The only component that is critical with regard to quality is the output transformer, the difference between a good one and a small cheap one is tremendous. Any good transformer having a primary impedance of about 8kΩ will do.

Because of the high gain of the EF86, care should be exercised in the layout of the components. The main sources of noise in an amplifier are the components associated with this valve and if good noise figures are wanted R3, R4, R5 and R6 should be high stability types. The unscreened lead to the grid of the first valve should be kept as short as possible.

All the main components are mounted on a chassis

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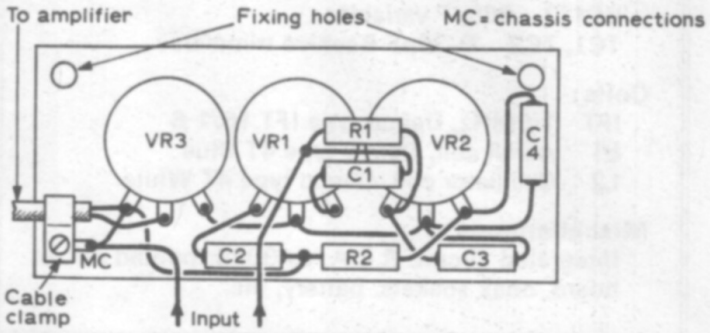

Fig. 2: The wiring of the tone control panel.

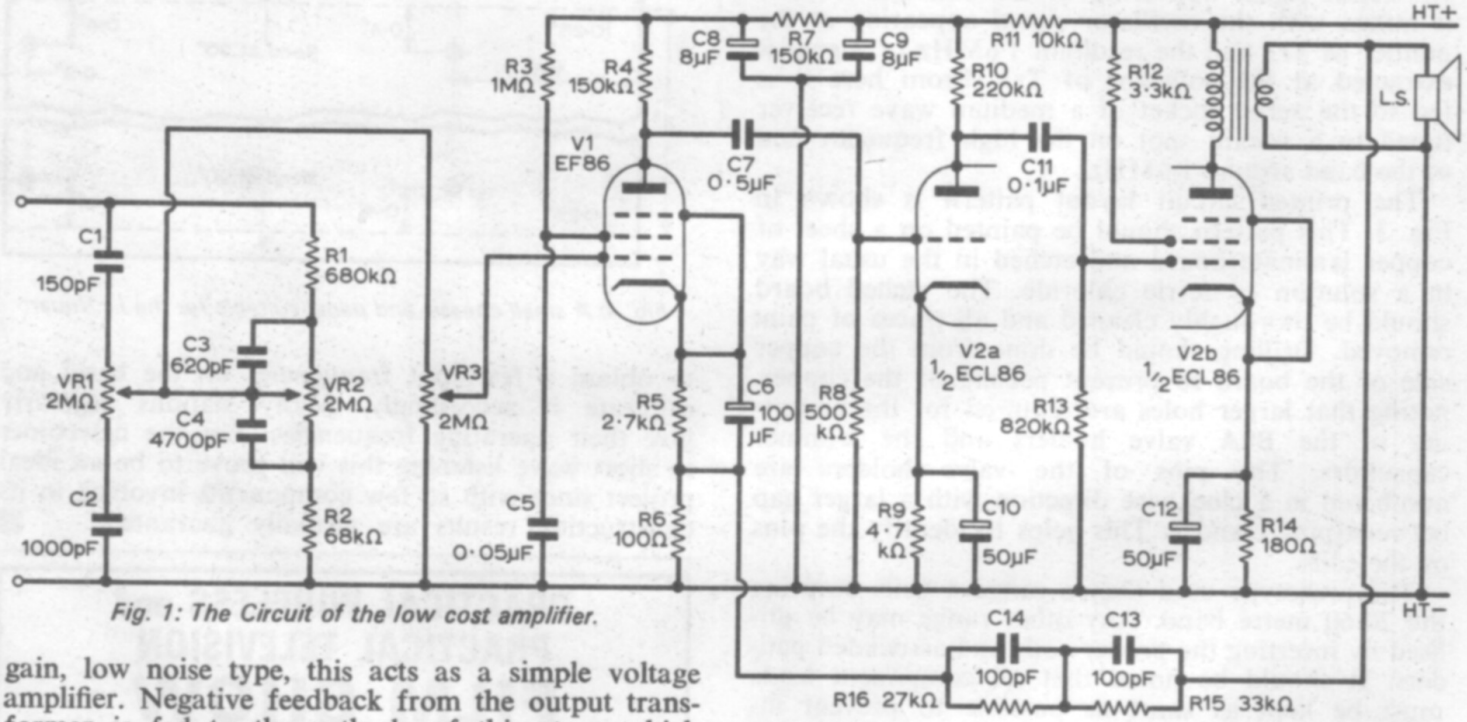

Fig. 1: The Circuit of the low cost amplifier.

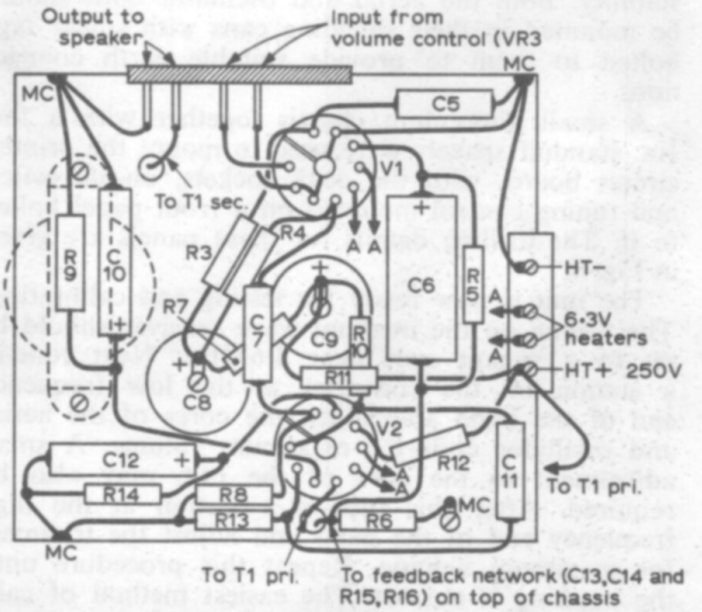

Fig. 3: The under chassis wiring.

Table 4: General comparison of available diodes

Construction	Material	Typical parameters: Maximum forward current	Typical parameters: Average reverse current	Typical parameters: Reverse voltage	Encapsulation	Cost	Application
Point contact	Germanium	50mA	10–500μA	30–150V	glass	1s. to 5s.	V.H.F. signal diode
Gold bonded	Germanium	100mA	7–200μA	30–150V	glass	1s. 1d. to 5s.	V.H.F. signal diode
Junction	Germanium	1A	1–100μA	100–800V	glass, metal and plastic	3s. to 10s.	general purpose
	Silicon	1A	0·01–1μA	100–800V		2s. to 10s.	
Whiskerless diffused	Silicon	200mA	0·01–1μA	50–200V	glass	2s. to 5s.	High-speed switching
Diffusion	Silicon	>250A	0·01–100μA	100–1,200V	metal and plastic	see table 1	General purpose and rectification
Planar	Silicon	100mA and 10A	0·001–1μA	25–800V	glass, metal and plastic	1s. to £1 £2 upward	Signal Power rectification h.f.
Avalanche diffused	Silicon	>50A	0·01–100μA	200–1200V	metal and plastic	10s. upward	Switching and rectification with transients
Bridges	Silicon	>10A	0·01–100μA	100–1000V	metal but mainly plastic	11s. to £20	Transformer power rectification

Figure 11 illustrates two bridge encapsulations primarily intended for use as rectifier bridges. Figure 11(a) shows a 1·8A silicon rectifier bridge which can be wired directly to a printed circuit without the necessity of a heatsink. Figure 11(b) shows a 10A silicon rectifier bridge which can be bolted to a heatsink. Both are considerably smaller than general attempts to mount four diodes to give the same performance.

Conclusion

Table 4 summarises the main methods of construction, their parameters, cost and uses. This should not be regarded as absolute in any parameter or statement but just a typical device range of the particular construction. There are many hundreds of different device types and this article will have served its purpose if the search for a required diode is reduced to a given form of construction.

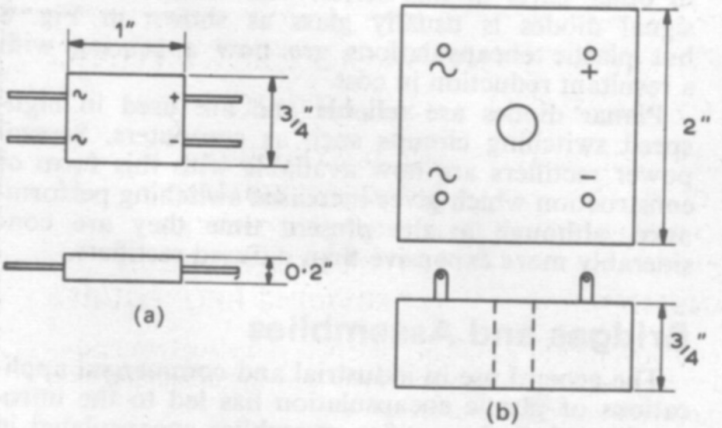

Fig. 11: (a) 1·8A and (b) 10A bridge encapsulations.

TO BE CONTINUED

LOW COST VALVE AMPLIFIER

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★ components list

Resistors:

R1 680kΩ	R9 4·7kΩ
R2 68kΩ	R10 220kΩ
R3 1MΩ high-stab.	R11 10kΩ
R4 150kΩ high-stab.	R12 3·3kΩ 1 watt
R5 2·7kΩ high-stab.	R13 820kΩ
R6 100Ω high-stab.	R14 180Ω 2 watt
R7 150kΩ	R15 33kΩ
R8 560kΩ	R16 27kΩ

All 10% ¼ watt except where stated.

Capacitors:

C1 150pF	C8, C9 8μF 350V
C2 1000pF	C10 50μF 25V
C3 620pF	C11 0·1μF 150V
C4 4700pF	C12 50μF 25V
C5 0·05μF 150V	C13 100pF
C6 100μF 25V	C14 100pF
C7 0·5μF 150V	

Miscellaneous:

VR1, VR2, VR3 2MΩ log pots.
V1 EF86
V2 ECL86

Metal chassis, metal panel (see text); Output transformer (see text); Two B9A valve bases. Suitable power supply.

about 6 × 6 × 2½ ins., and the controls on a panel 6 × 2½. No details are given for a power supply as any capable of giving between 200V. and 350V. at 75mA and 6·3V. 1·5A. will do. ■